

ABSTRACT OF THE DISCLOSURE

A spiral wound membrane filtration module is operated with a single pass through the feed side and without cross-flow on the permeate side. Recovery is 70% or more and feed side velocities are between 0.05 and 0.4 feet per second. The module may have dams in the spacer material on the shell/feed side to provide a feed path with multiple passes across the membrane leaves. A small-scale system for using such a module, for example to soften and filter water with a nanofiltration membrane, is described. The system includes a chemical cleaning apparatus and process.